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ABSTRACT

This is the first of a series of reports providing information and statistics on subjects of interest to educational policymakers and practitioners. Based on a research paper, "Course-Taking Patterns in the 1980s," by Margaret E. Goertz, the report's focus is on what is being studied and how this has changed over time (generally between 1982 and 1987) for high school graduates and college-bound high school seniors. Information on subjects studied by high school graduates and college-bound seniors is presented. Course-taking pattern information focuses on fourth-, eighth-, and 11th-grade students. The information is placed in context via a brief discussion of school reform trends. Data are broken down variously by subject, race, parents' educational attainment, and/or sex. Racial groups represented include White, Black, Hispanic, American Indian and Asian American; some detail is provided for English-versus non-English speakers and for Asian Americans and Hispanics. It is concluded that a principal element of educational reform in the 1980s has been the increase in course-taking requirements for high school graduation, primarily the increase in the number of years that students are required to study academic subjects. Beyond that, strong recommendations have been made to require academic courses for students expecting to go to college and to increase attention in the elementary and junior high school years to subjects supporting an increasingly technological economy. Twenty-three data tables, mostly showing data between 1982 and 1987; 20 graphs; and technical notes on the study methodology are included. (TJH)

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A POLICY INFORMATION REPORT

WHAT AMERICANS STUDY

U.S. DEPARTMENT OF EDUCATION
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CONTENTS

Introduction: The Core of School Reform 2

High School Graduates 4

College-Bound Seniors 8

Eleventh Grade 10

Eighth and Fourth Grades 13

Summary 15

Appendix A, Tables 18

Appendix B, Technical Notes 27

Preface

What Americans Study inaugurates a series of reports from the Policy Information Center at Educational Testing Service (ETS). Drawing on data uniquely available to ETS and on technical research conducted by ETS staff, the reports will provide information and statistics on matters of interest to educational policy makers and practitioners. Thus, they will be succinct and free of technical terms and professional jargon.

This report is drawn from a research paper, *Course-Taking Patterns in the 1980s*, by Margaret E. Goertz, senior research scientist at ETS, based on a study funded by the Center for Policy Research in Education (CPRE) at Rutgers University.

The ETS Policy Information Center assumes all responsibility for accurately reflecting the data and findings of that earlier report.

Increasing course requirements in key academic subjects has been a central theme of educational reform in this decade. This report provides information on what is being studied and on how this has changed over time for high school graduates and college-bound seniors. It also describes course-taking patterns for eleventh-, eighth-, and fourth-grade students.

Paul E. Barton
Director
ETS Policy Information Center

Acknowledgments

We are particularly indebted to the Center for Policy Research in Education and its director, Susan Fuhrman, for its sponsorship of the research report by Margaret E. Goertz, on which this brief report is based. *What Americans Study* was reviewed by Richard Coley, Margaret E. Goertz, Lynn Jenkins (who improved the clarity of the manuscript considerably), Leonard Ramist, and Donald Rock of Educational Testing Service. It was also reviewed by Solomon Arbeiter of the College Board. Carla Meadows provided the word processing services.

Richard Coley assisted with creation of graphs and charts. Peter Mann provided overall publication supervision and Al Benderson, editorial services. Ric Bruce was the designer.

THE CORE OF SCHOOL REFORM

The decade of the 1980s has been a time of sweeping reform efforts in public education. At the heart of many of these efforts has been the view that schools should require students to take a core of rigorous academic subjects.

In the history of American education, however, the pendulum has swung back and forth a number of times regarding the importance of a rigorous core curriculum and the amount of leeway students should have in shaping their academic programs. Wherever the pendulum is in its swing, there is always much disagreement about the purposes of education and which courses are essential. While competing views also have been expressed in the 1980s, there has been a considerable degree of consensus — particularly in the first half of the decade — about the inadequate performance of the schools, the social and theoretical forces in the prior decade that fed these inadequacies, and the types of changes that should be undertaken at the state and national level. This consensus is reflected in the wave of education mandates by state legislatures, the actions of governors, and the active involvement of the business community in educational reforms.

In summarizing the findings of 33 education studies and reports issued in the 1980s, Harold Howe II concludes that the motivation to improve school quality is greater today than in the post-Sputnik period. He explains, "Nowadays a more powerful connection has been forged to argue for improving school quality: the significance of education for our capacity to compete economically with the rest of the world." This concern about economic competition has affected the nature of the educational reforms under way, including the current emphasis on mathematics, science, and technology in the curriculum.

In the early 1970s, experts began to argue that the dilution of the school curriculum and the lack of rigorous content were responsible for the decline of American education. At that time, the Blue Ribbon Panel on the decline of Scholastic Aptitude Test (SAT) scores, created by The College Board and chaired by Willard Wirtz, issued a report, *On Further Examination*, in which it concluded:

> There has been a significant dispersal of learning activities and emphasis in the schools, reflected particularly in the adding of many elective courses and a reduction of the number of courses that all students are required to take. We are inclined to believe . . . that probably well-intentioned change has reduced the continuity of study in major fields . . . [and] has been accompanied by a tendency to avoid precise thinking.

Perhaps the most stinging indictment of education in recent years came in *A Nation At Risk*, issued in 1983 by the National Commission on Excellence in Education, created by Secretary of Education T.H. Bell in 1981. The report examined patterns of course-taking for high school students between 1964 and 1969 and between 1976 and 1981, and concluded:

> Secondary school curricula have been homogenized, diluted, and diffused to the point that they no longer have a central purpose. In effect, we have a cafeteria-style curriculum in which the appetizers and desserts can easily be mistaken for the main courses. ...this curricular smorgasbord, combined with extensive student choice, explains a great deal about where we find ourselves today.

The commission bore in on the electives, reporting that "25 percent of the credits earned by general track high school students are in physical and health education, work experience outside the school, remedial English and mathematics, and personal service and development courses, such as training for adulthood and marriage."

In 1985, the Education Development Center counted the recommendations for various types of school improvements in 33 reform studies and reports (Thirty-three Studies that Inform Local Action by Marilyn Clayton Felt). The center found that a majority of the reports called for a core program of study for high school students consisting of four years of English,

three years of mathematics, at least three years of science, three years of social studies, and a minimum of two years of foreign languages. These were to be achieved at the expense of electives, which were thought to comprise too large a part of the high school curriculum.

Action was forthcoming, particularly at the state level, where legal responsibility for education rests. In the 1984-85 school year, Educational Testing Service surveyed the states to document their standards (*State Educational Standards: A 50-State Survey*, Margaret E. Goertz, 1986) and found that *41 states had raised standards for the number and types of courses required for high school graduation*. This represents more state initiatives than for any other area of educational reform. Further, in most states, local school districts often imposed even more stringent standards. These increased graduation requirements began to affect graduating classes in 1985, but, as shown in the following table, the bulk of the impact occurred in 1987, 1988, and 1989.

An update of this ETS survey was conducted for the 1986-87 school year, and reform activity was found to have slowed, although student and teacher testing activity continued to increase.

EFFECTIVE DATE OF STATE REFORMS IN HIGH SCHOOL COURSE REQUIREMENTS, BY GRADUATING CLASS

Reform Affects Class Graduating in:	Number of States
1985	3
1986	—
1987	11
1988	10
1989	15
1990	—
1991	1
1992	1
In effect at time of 1985 survey	4
No statewide requirements	5

What Americans Study reports *actual* student course-taking patterns in the 1980s, generally based on large surveys with scientifically drawn samples of students. For high school graduates, we are able to report trends from 1982 to 1987, based on students' actual school transcripts. For college-bound seniors who took the SAT and filled out its Student Descriptive Questionnaire, we can describe course-taking patterns in the years 1975, 1982, and 1988, and compare these patterns to those recommended for college-bound seniors in *A Nation At Risk*. While data from the SAT is not representative of all college-bound seniors, it is based on over a million students who take the SAT each year.

The information provided for 11th-, 8th-, and 4th-grade students is at a single point in time (1984). It provides a detailed look at not only *what* students study, but also at *who* studies which subjects, in terms of gender, racial/ethnic group, and parents' socioeconomic status. The data also provide a baseline against which we hope to report trends in the future. A statistical analysis has helped to identify factors associated with the differences found in course-taking among racial and ethnic groups.

At these grade levels, we are able to separate Hispanic- and Asian-American student subgroups in terms of whether English or another language is the predominant language spoken in the home (thus, for example, we refer to "language-minority Hispanic students" and "non-language-minority Hispanic students." The definitions are provided in the technical notes of the Appendix, page 27). Since subgroups typically reported are not homogenous populations, it is desirable to report finer categories wherever data permit.

The source of data is identified in each section of the report, and more fully in Appendix B (Technical Notes). Detailed statistical tables are also provided in Appendix A, for reference. The full technical report, on which this brief publication is based, is available.

It is important to note that we can report on only the *quantity* of courses taken and subjects studied; we know nothing from these data sources about *quality*. A recent study by the Center for Policy Research in Education identifies the need to have better information on quality and content and the pitfalls of relying only on course titles to measure the changes taking place (*The Implementation and Effects of High School Graduation Requirements: First Steps Toward Curricular Reform* by William H. Clune, Paula White, and Janice Patterson, February 1989).

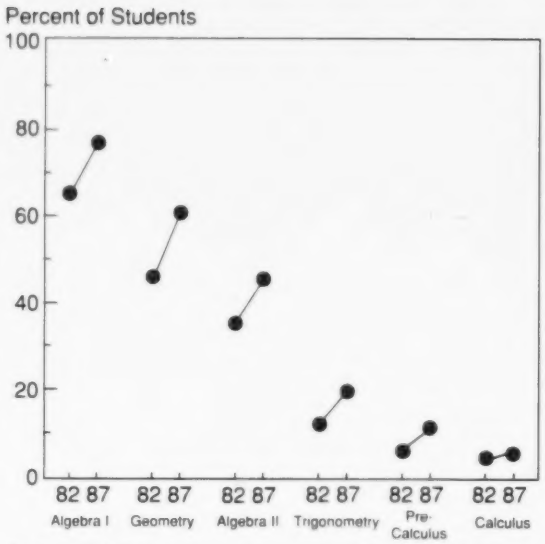
HIGH SCHOOL GRADUATES

While the long-term effects of reforms on the American high school curriculum have yet to unfold, we do know that there were noteworthy increases in the number of academic courses taken by the graduating class of 1987 as contrasted with the class of 1982, the year before the issuance of *A Nation at Risk*. The class of 1987 was in its freshman year when that watershed report was issued, and state after state raised graduation requirements during the following four years. The accumulation of changes in requirements during these four years will not fully affect course-taking for several years yet. Voluntary changes in course offerings by schools and districts and individual student decisions also influenced the number and types of courses taken.

The comparison of subjects studied by 1987 graduates and 1982 graduates is made possible by two federally funded studies of student transcripts — the *High School and Beyond* study (1982 graduates) and the *High School Transcript Study* (1987 graduates)*. As displayed in Figure 1, there were substantial gains from 1982 to 1987 in the percentage of graduates taking algebra, geometry, pre-calculus and trigonometry.

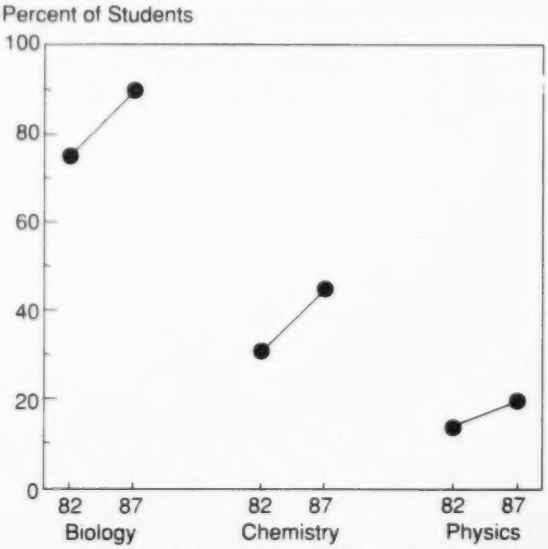
The percentage of students studying geometry rose most dramatically, increasing by 15 points

Figure 1
Percentage of High School Graduates Who Took Mathematics Courses: 1982 and 1987



See Appendix A, Table 1 for details and statistical significance of changes

Figure 2
Percentage of High School Graduates Who Took Science Courses: 1982 and 1987

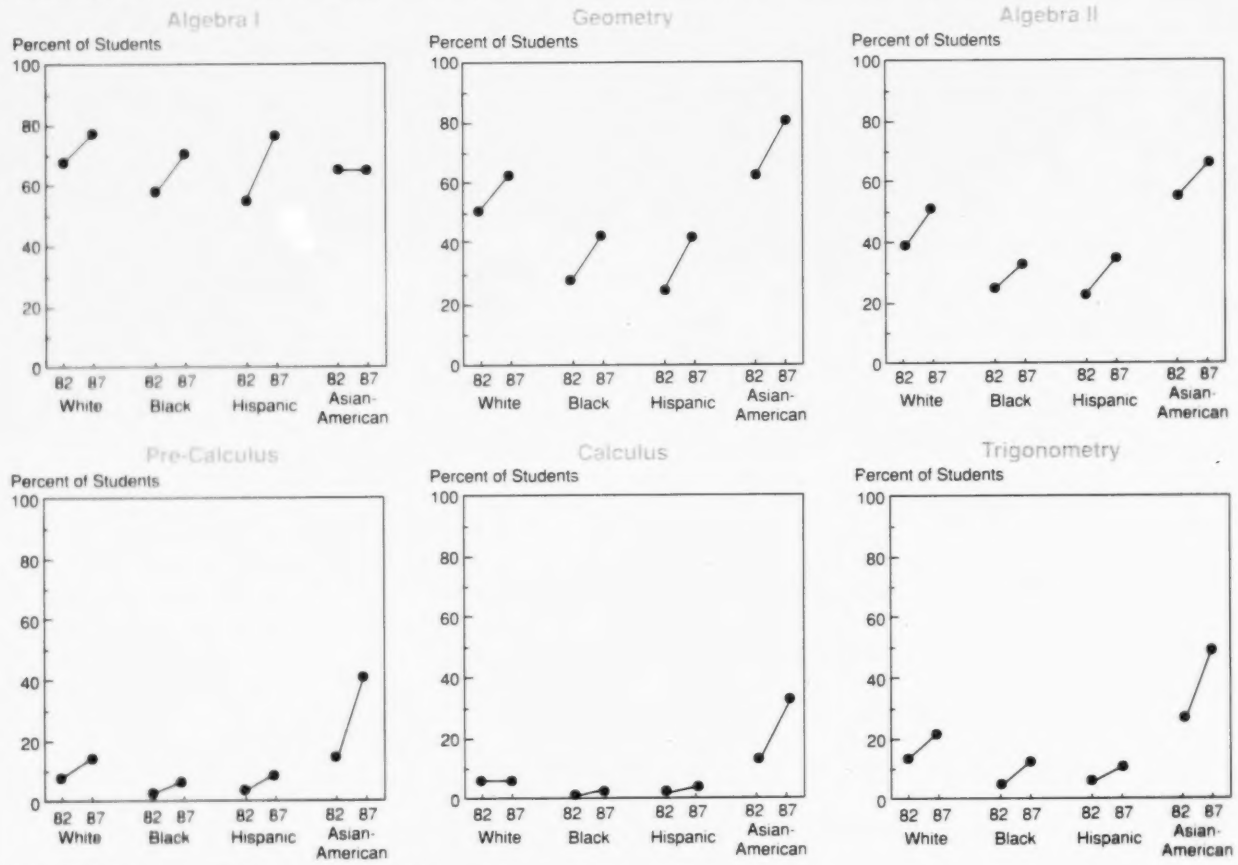


See Appendix A, Table 3 for details and statistical significance of changes

*See Appendix B page 27 for detailed references to the studies from which data are drawn, as well as the report on which this publication is based. Only statistically significant changes between 1982 and 1987 are described in the text. Appendix tables identify those differences that are significant.

Figure 3A

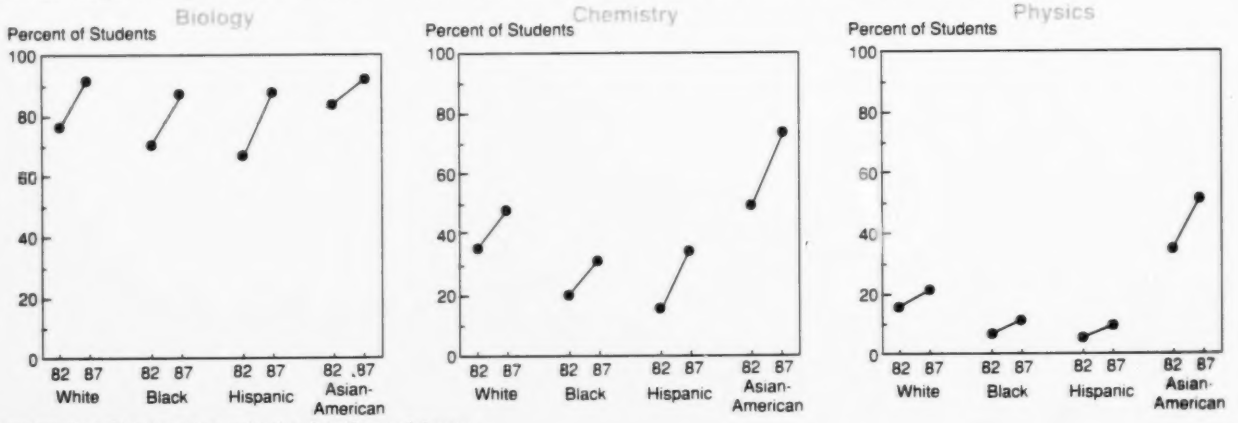
Percentage of High School Graduates Taking Mathematics Courses, 1982 and 1987, by Race/Ethnicity



See Appendix A, Table 5 for details and statistical significance of changes

Figure 3B

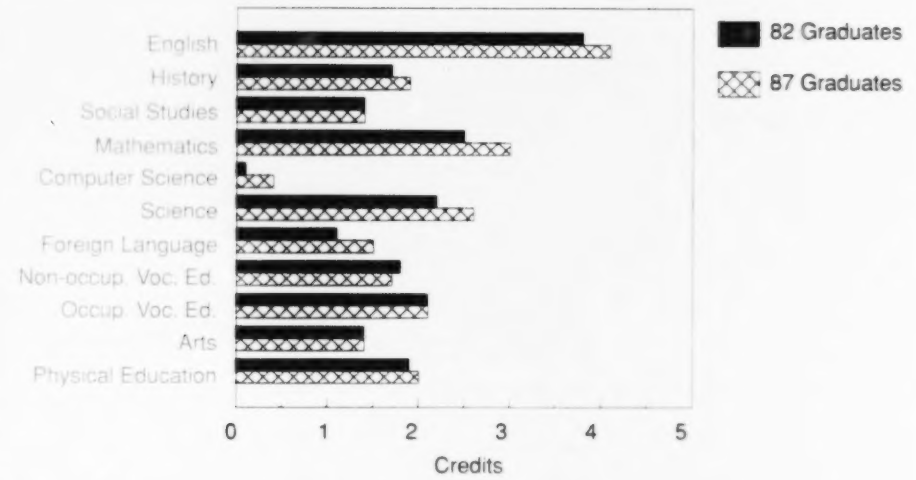
Percentage of High School Graduates Taking Science Courses, 1982 and 1987, by Race/Ethnicity



See Appendix A, Table 6 for details and statistical significance of changes

Figure 4

Average Number of Credits Earned by High School Graduates, 1982 and 1987



See Appendix A, Table 7 for details and statistical significance of changes

across the five-year period. There was essentially no gain in calculus course-taking, although the percentage of students studying pre-calculus doubled. The gains for males and females were essentially parallel (See Appendix A, Table 2). Differences in mathematics course-taking patterns between male and female graduates, as measured in these two surveys, were generally small.

As shown in Figure 2, gains in science course-taking were comparable to those in mathematics. Nine in 10 of the 1987 graduates took biology, and nearly half took chemistry. Just one in five took physics. In all three subjects, the percentage of students taking courses increased significantly from 1982 to 1987. Gains for males and females were equivalent for chemistry and biology (See Appendix A, Table 4). However, a gender gap in physics course-taking persisted between 1982 and 1987, with 25 percent of males taking physics in 1987 compared with 15 percent of females.

Increases in mathematics course-taking were substantial for all racial/ethnic groups, and in some cases, dramatic (See Figure 3A). White, Black, and Hispanic students failed to gain ground only in calculus.

By 1987, nearly eight in 10 White graduates were taking algebra I and enrollment in algebra II hit the halfway mark. Nearly two in three White students were taking geometry. Despite gains in pre-calculus and trigonometry (but not in calculus) course-taking from 1982 to 1987, only a relatively small percentage of White students took these subjects.

Among Black graduates, the most notable gain (15 percentage points) was in geometry, although less than half were taking the course in 1987. While Black 1987 graduates were more likely than in 1982 to study all subjects except calculus, they continued to lag substantially behind White graduates in advanced mathematics courses.

The percentage of Hispanic graduates taking algebra I jumped 22 points from 1982 to 1987, pulling even with Whites. For the rest of the mathematics courses presented here, however, the patterns for Hispanics generally resembled those of Blacks.

The percentage of Asian-American graduates taking algebra I held steady from 1982 to 1987, and was 12 points below that of White graduates (we assume that many Asian-American students had "placed out" of algebra I, and did not have to take it in high school). However, a higher percentage of Asian-Americans were enrolled in all other mathematics courses. For trigonometry, their enrollments were more than double the White enrollments; for pre-calculus, more than triple; and for calculus, more than five times.

In the sciences, course-taking gains were registered for all racial/ethnic groups, although the percentage point gains were generally more modest for physics than for other subjects (See Figure 3B).

By 1987, nine in 10 White graduates had taken biology and nearly half had taken chemistry. However, just one in five had studied physics.

The percentage of Black graduates taking biology increased a substantial 14 points from 1982 to 1987. While there were gains in chemistry, just three in 10 students of the class of 1987 had taken the course. With a gain of four percentage points in the five-year period, only one in 10 Black students had taken physics by 1987.

Hispanic graduates gained somewhat more ground than did Black graduates during the period, so that their science course-taking was about even with Black graduates in 1987, having been lower in 1982. The percentage of Asian-American graduates studying biology, chemistry, and physics increased across the five-year period; they showed large gains in physics course-taking, with half taking it by 1987 graduation.

There were also statistically significant gains in the average number of credits taken by students in English, history, mathematics, computer science, science, and foreign languages by 1987 (See Figure 4).

There was a slight decline across time in the average number of credits earned in non-occupational vocational education courses (such as "career awareness"), but no change in credits for *occupational* courses. While many have thought that increased academic requirements were causing enrollment declines in occupational courses, this has not yet been the case. Course-taking in social studies, the arts, and physical education held steady.

In all academic areas where recommendations had been made in the early 1980s for increased course requirements, increases have been registered. Although it may appear that social studies is an exception to the rule, history credits rose, and history is generally included in social studies in the major reports on education.

While it is principally students in the academic track who take rigorous academic courses, some significant qualifications must be made. In 1982, more than half of the vocational and general track graduates had taken algebra I, and this percentage rose to over two-thirds by 1987. By 1987, one in five vocational and three in 10 general track students had taken geometry. Only a small percentage went beyond geometry (see Appendix A, Table 8).

COLLEGE-BOUND SENIORS

In the 1983 report *A Nation at Risk*, the National Commission on Excellence in Education (NCEE) recommended that *college-bound* high school students take:

- Four years of English
- Three years of mathematics
- Three years of science
- Three years of social studies
- Two years of a foreign language.

These recommendations received widespread attention and action. Actually, efforts had been under way for several years before this report was issued to increase course-taking requirements. The governing boards of public higher education institutions were beginning to question the adequacy of their admission requirements in the early 1980s. The 1978 report *On Further Examination* had sensitized higher education and state officials to slipping SAT scores and waning academic standards. Students were taking fewer college-preparatory courses in 1980 than 10 years earlier.

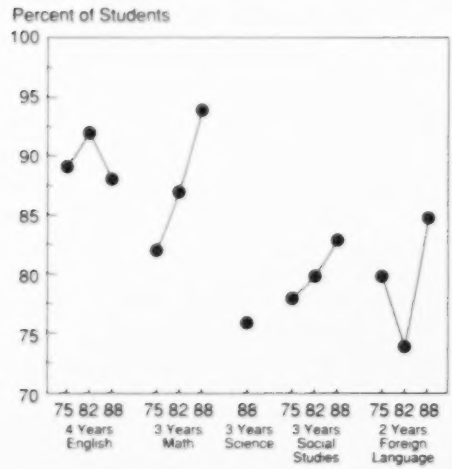
One way to look at the changes that have occurred is to see what percentage of college-bound seniors took the courses recommended by the Excellence Commission. Although data representative of all college-bound seniors are not available, the more than one million students taking the SAT are asked to fill out a voluntary Student Descriptive Questionnaire, and for the 95 percent of the students who did so in 1988, data on the courses they took in high school are available. There were small increases in the percentage taking the recommended English, mathematics, and social studies courses between 1975 and 1982 (See Figure 5). There were further increases from 1982 to 1988 in mathematics and social studies. In addition, more students met the recommended foreign language requirement in 1988 than in 1975.

After rising from 1975 to 1982, the percentage of college-bound seniors taking four years of English declined from 1982 to 1988, and we do not know what accounts for this phenomenon. One possibility is that some students may have forfeited a year of English in order to meet increasing requirements in other subjects.

Male and female differences in mathematics and science course-taking were modest, with females being slightly less likely than males to take these courses (See Figure 6). The exception was in physics, where the advantage held by males remained considerable.

In mathematics, social studies, and foreign languages, White, Black, Hispanic, Asian-American, and American Indian college-bound seniors moved closer to meeting the Excellence Commission's recommendations between 1982 and 1988. In English, however, the percentage for all groups declined. No information

Figure 5
Percentage of College Bound Seniors Meeting NCEE Curriculum Recommendations, 1975, 1982, 1988*



*Seniors who took the SAT and met the course-taking recommendations of the National Commission on Excellence in Education

is available for science course-taking across the subgroups in 1982 (See Figure 7).

White and Black college-bound seniors dropped the most between 1982 and 1988 (five percentage points) in the percentage taking four years of English. The differences across subgroups in 1988 were not large, although Black students were less likely than their peers to meet the minimum recommended standards in English (See Figure 7).

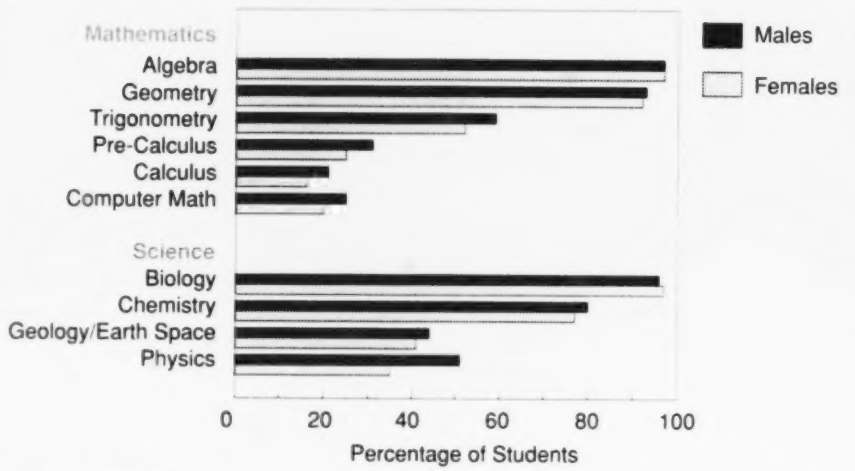
Racial/ethnic disparities in the percentage of students taking three years of mathematics were greatly narrowed in this six year period; just five percentage points separated the bottom group from the top (See Figure 7).

Fewer students from any racial/ethnic group met the Excellence Commission's minimum requirements in social studies in 1988. Increases across time in the percentage of students taking three years of social studies were generally small, from three to six percentage points. By 1988, the differences across groups were also small, with a range of 5 percentage points (See Figure 7).

By 1988, substantially more students in all population subgroups were taking two years of foreign language, and the range across groups narrowed in the 6 years from 20 to 12 percentage points (See Figure 7).

Figure 6

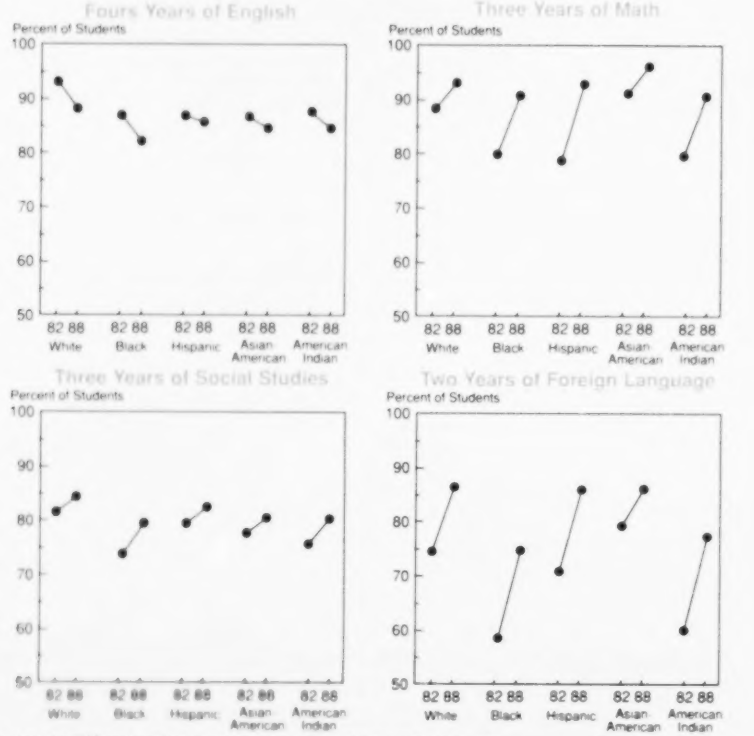
Percentage of College-Bound Seniors* Taking Math and Science Courses in 1988, by Sex



*Seniors Who Took the SAT

Figure 7

Percentage of College Bound Seniors Meeting NCEE Recommendations in English, Math, Social Studies, and Foreign Language 1982 and 1988*



*Seniors who took the SAT and met the course taking recommendations of the National Commission on Excellence in Education

ELEVENTH GRADE

Data from the 1984 National Assessment of Educational Progress (NAEP) show course-taking patterns at the 11th grade level that are similar to those observed for 12th graders, discussed in the previous sections (calculus and physics, usually taken in the 12th grade, are not included in the following tables for 11th graders).

PERCENTAGE OF 11TH GRADE STUDENTS TAKING MATHEMATICS AND SCIENCE COURSES, 1984

Courses	Male	Female
Algebra I	83	84
Geometry	62	59
Algebra II	53	52
Biology	81	83
Chemistry	41	38
Computer Programming	32	27

See Appendix A, Table 10 for details and standard errors.

The racial/ethnic variations in algebra and geometry course-taking were very large. Almost *all* Asian-American Non-Language-Minority (NLM) 11th graders reported taking algebra I, contrasted with seven in 10 of Black, Hispanic Language-Minority (LM), and Asian-American Language-Minority (LM) students.* Nearly nine in 10 White students took algebra, as did eight in 10 Hispanic (NLM) students.

PERCENTAGE OF 11TH GRADE STUDENTS TAKING

Algebra I	Geometry	Algebra II	
87	66	56	White
71	46	40	Black
			Hispanic
79	52	46	Non-Language Minority
69	35	41	Language Minority
			Asian-American
97	72	72	Non-Language Minority
70	55	65	Language Minority

See Appendix A, Table 11 for details and standard errors.

The racial/ethnic gaps in the percentage of students taking algebra II were about as wide as for algebra I, with substantially fewer in all groups taking the course. More than seven in 10 Asian-American (NLM) students took algebra II, compared to four in 10 Black and Hispanic (LM) students. The differences in the percentage of students taking geometry were somewhat larger, ranging from 35 percent of Hispanic (LM) students to 72 percent of Asian-American (NLM) students.

In science, about 80 percent of the students reported taking biology, regardless of their race/ethnicity (except for Asian-American (NLM) students). Considerable differences were evident in chemistry course-taking, however. More than 60 percent of the Asian-American students reported taking chemistry, compared to 42 percent of the White students and about 30 percent of the Black and Hispanic (NLM) students. The latter groups were the least likely to have enrolled in computer programming as well.

We find large differences in course-taking when students are grouped by level of parental education. More than 90 percent of the students whose parents had some postsecondary education reported taking algebra I, compared to 78 percent of those whose parents were high school graduates and 60 percent of students whose parents had not completed high school. Two-thirds to three-quarters of students with college-educated parents took algebra II and geometry, but only three in 10 students whose parents had not completed high school reported doing so (See Appendix A, Table 12).

Students with college-educated parents were only somewhat more

A special study as part of the 1984 national assessment enabled NAEP to identify "language minority students". These are students from homes where most people in the home speak a language other than English. For more details, see Technical Notes in Appendix B, p 27.

PERCENTAGE OF 11TH GRADE STUDENTS TAKING

Biology	Chemistry	Computer Programming	
82	42	31	White
82	29	22	Black
			Hispanic
82	30	22	Non-Language Minority
86	22	20	Language Minority
			Asian American
71	62	44	Non-Language Minority
83	65	52	Language Minority

See Appendix A, Table 11 for details and standard errors.

PERCENTAGE TAKING TWO OR MORE YEARS OF FOREIGN LANGUAGES

	Race/Ethnicity
30	White
23	Black
33	Hispanic
	Parents' Education
15	Not Graduated High School
19	High School Graduate
39	Postsecondary Education

See Appendix A, Table 13 for details and standard errors.

NUMBER OF VOCATIONAL COURSES

Percentage Distribution			
All Students	**Male**	**Female**	**Number of Course-Years**
42	49	36	None
32	30	34	½ to 1
20	16	23	1½ to 2½
7	6	7	More than 2½

See Appendix A, Table 14 for details and standard errors.

NUMBER OF VOCATIONAL COURSES

Percentage Distribution			
White	**Black**	**Hispanic**	**Number of Course-Years**
42	41	46	None
32	32	32	½ to 1
20	21	17	1½ to 2½
7	6	5	More than 2½

See Appendix A, Table 14 for details and standard errors.

likely to have taken biology or computer programming, while there are considerable differences for chemistry course-taking by education of the parents: 53 percent of students whose parents had the highest level of education took the course versus 21 percent of students whose parents had the lowest level of education (See Appendix Table 12).

White and Hispanic students were somewhat more likely than Black students to report taking two or more years of foreign languages. Much larger variations appear when students are grouped by level of parental education; the higher the level of parents' education, the larger the percentage of students taking foreign languages.

Most surveys ask students only to report the type of track they were enrolled in — that is, academic, general, or vocational. However, this simple division into tracks is inadequate to fully reflect vocational enrollments because significant portions of both academic and general track students take some vocational courses. The 1984 National Assessment therefore asked 11th-grade students to report the vocational courses they had taken to provide a more detailed picture.

Almost six out of 10 11th graders had taken some vocational education courses. More than three in 10 completed from a half to one complete year, and one in five had completed from one-and-a-half to two-and-a-half years. Just seven percent had taken more than two-and-a-half years; however, it should be recognized that serious vocational students would concentrate their studies in vocational courses during their senior year of high school.

Females were more likely than males to take vocational courses and more likely to take from one-half to two-and-a-half courses.

Females were more likely than males to have taken one or more years of business courses; 56 percent of females took these courses compared with 43 percent of males. A considerably larger percentage of males than females took courses in agriculture, auto mechanics, the construction trades, drafting, electronics, machine shop, and welding. Females were much more likely than males to enroll in cosmetology, home economics, food service occupations, and secretarial/office work courses. Course-taking behavior was more "gender neutral" in the commercial arts, computer programming, the health fields, and sales and merchandising.

While many have thought that minority students were over-represented in vocational education, this turns out

not to be the case. There was little difference by race/ethnicity in the number of courses taken.

While there were no differences between students whose parents did not graduate from high school and those who did in the number of vocational courses taken, students whose parents had postsecondary education were less likely to take vocational courses (although over half had taken some courses and one in five had taken one-and-a-half or more).

A statistical analysis was undertaken to identify factors associated with the total number of courses taken by students in English, social studies, mathematics, science, and foreign languages. Differences in students' sex, level of parental education, study aids in the home, and educational expectations accounted for 25 to 37 percent of the variation in course-taking among the subgroups (except for Hispanic (LM) students). Education of the parent is positively related to course-taking for White, Black, and Asian-American students. At the same levels of parental education, the number of study aids in the home is also positively associated with higher-level course-taking among White students. Higher educational expectations were related to higher-level course-taking among White, Black, Hispanic (NLM), and Asian-American (LM) students. The socioeconomic level of the school had a minimal impact on this measure of course-taking. School "climate", as measured in the study, had none at all.

EIGHTH AND FOURTH GRADES

Perhaps not surprisingly, there is a high degree of uniformity in subjects studied in the 8th grade, particularly with regard to the "basics." This is because choices about course-taking are limited at the junior-high level, although not always absent. We report here on those subjects not offered universally and on those with varying degrees of student exposure. We also report on two subjects — gym and science — that have become nearly universal for majority students, but somewhat less so for minority students. A similar review of course-taking will be provided for 4th-grade students as well.

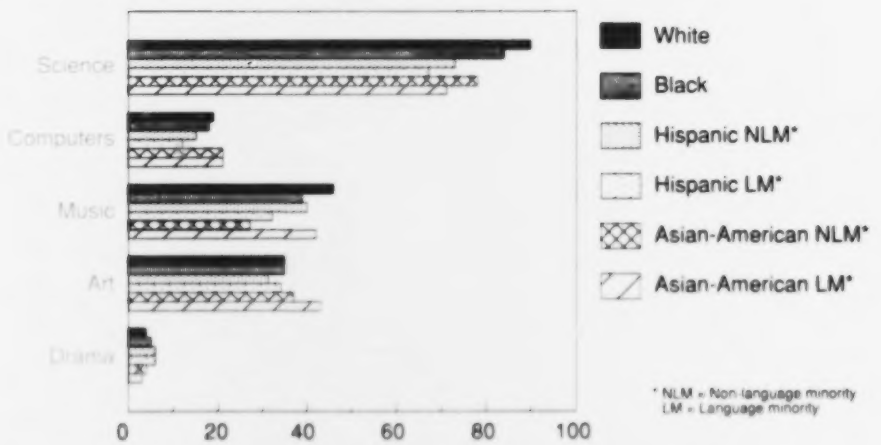
EIGHTH GRADE

Nine in 10 White 8th-grade students reported that they had a science class at least once a week, ranging down to seven in 10 for Hispanic (LM) students. This is a lot of variation in a subject that has been moving higher in the educational priorities. About one in five students reported taking a course on computers, although this proportion dips to one in seven among Hispanic (NLM) students and one in eight among Hispanic (LM) students. Otherwise, there is a fair degree of uniformity at the 8th-grade level among racial/ethnic groups with respect to computer classes (See Figure 8).

Among all the subjects we report on for the 8th grade, only gym nears the status of a standard offering, although subgroup variation remains (See Appendix A, Table 15). From nearly a half to just over a quarter of students said that they studied music; about a third studied art; and a negligible percentage, drama (See Figure 8).

When 8th-grade students are grouped by the level of their parents' education, there are generally no large differences in subjects studied, except in music, and foreign languages. In music, students whose parents were high school graduates had a 10 percent higher enrollment than those whose parents had less education. This advantage in music is maintained among students with parents having postsecondary education. In foreign languages,

Figure 8
Percentage of 8th Graders Having Classes in Science, Computer, and the Arts, by Race Ethnicity, 1984



See Appendix A, Table 15 for details and standard errors

these students also have considerably greater exposure (27 percent as compared with 14 percent) (See Appendix A, Table 16). The relatively small differences depending on parents' education are in marked contrast to the large differences observed in the 11th-grade data described in the previous section.

A statistical (path) analysis was carried out to identify the student and school characteristics that were associated with differences in what students study*. The analysis indicated that the socioeconomic level of the parent was only modestly related to the number of subjects students studied. The strongest relationship observed was a positive association with the number of study aids in the home (one of the factors used to measure socioeconomic level).

FOURTH GRADE

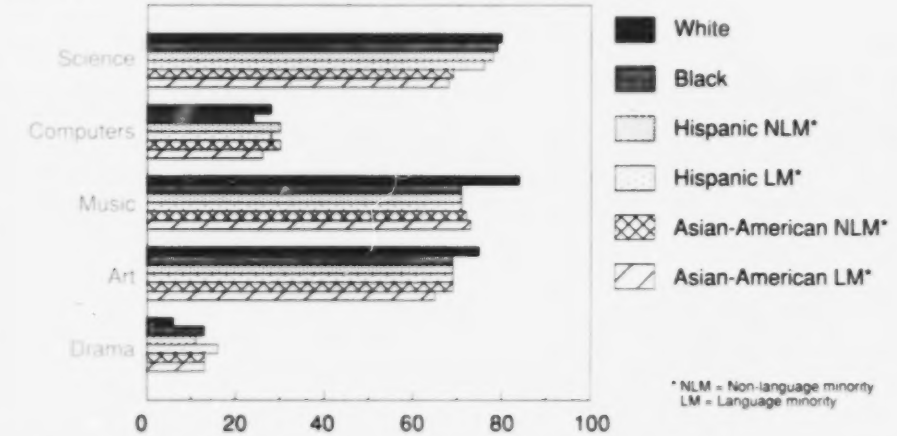
Among 4th graders, there is somewhat less uniformity in gym course-taking among subgroups than in the 8th grade, with a range from 85 percent for White students to 66 percent for Asian-American (LM) and Hispanic (LM) students (See Appendix A, Table 15). In science there is also somewhat less variation, with White, Black and Hispanic (NLM) students about even at four in five enrolled; in contrast, among Asian-American students, only seven in 10 students were taking science (See Figure 9).

Fourth-grade students were more likely to report studying computers than 8th-grade students, reaching three in 10 except among Black and Asian-American (LM) students, with one in four.

The large majority of 4th-grade students studied music and art, while a small percentage studied drama. It appears that art instruction is available to a vast majority of 4th-grade students from all racial/ethnic groups. However, for the minority student subgroups, about 10 percentage points fewer were studying music than White and Asian-American (NLM) students (See Figure 9).

Fourth-grade students with parents who were not high school graduates were somewhat less likely to be taking gym, music, and art than were those whose parents had more education. Extensive statistical analysis (path analysis) confirmed that curriculum exposure was only modestly related to the socio-economic status of the student.

Figure 9
Percentage of 4th Graders Having Classes in Science, Computer, and the Arts, by Race/Ethnicity, 1984



See Appendix A, Table 15 for details and standard errors

Specifically, the total number of science, computer, art, music, gym, and drama classes that students take once a week.

SUMMARY

A principal element of education reform in the 1980s has been to increase course-taking requirements for high school graduation, primarily by increasing the years of academic subjects that students must study. Forty-one states have done so. Beyond that, strong recommendations have been made (in *The Nation at Risk* report, for example) to require more academic courses for students expecting to go to college, and colleges and universities have raised their standards, in terms of additional course-taking, for admission. There has also been pressure on school systems to increase attention in the elementary and junior high school years to subjects, such as science and computer literacy, that support an increasingly technological economy. This report has summarized what evidence is available on how course-taking has changed across the decade and how the patterns vary for different population subgroups.

HIGH SCHOOL GRADUATES

There were strong gains in mathematics and science course-taking between 1982 and 1987 among high school graduates, except in calculus and physics, where gains were modest or nonexistent. Differences between males and females in mathematics and science course-taking were small by 1987, except in physics, where the percentage of males exceeded that of females by 10 points.

With few exceptions, gains in course-taking were registered by minority students as well as majority students in all mathematics and science courses. Some of these gains were impressive, while others were modest. For example, the percentage of Black graduates who took geometry jumped from 29 to 44; by comparison, the percentage of White graduates who took physics rose only from 16 to 21. For the aggregate of graduates in 1987, there were increases in the average number of credits earned in English, history, mathematics, computer science, science, and foreign languages.

Increases in academic course-taking were not confined to students in the academic track. By 1987, over two-thirds of vocational and general track students had taken algebra I, while one in five and three in 10, respectively, had taken geometry. Few students in these two tracks went beyond geometry. Three in four vocational and general track students had taken biology, and a few proceeded further in the sciences. While there has been widespread speculation that enrollments in vocational courses were being cut to accommodate increased academic requirements, this does not appear to be the case for high school graduates in the 1982 to 1987 period, when credits for occupational courses remained unchanged. What did slip slightly were enrollments in nonoccupational courses, such as general career awareness. Of course, there may be more pressure on vocational education enrollments as the new state requirements apply to more students through the rest of the decade.

COLLEGE-BOUND SENIORS

From the Student Descriptive Questionnaire filled out by SAT takers, we have the self reported course-taking patterns of a million college-bound seniors each year. From 1982 to 1988 there were increases in the percentage of seniors taking the years of mathematics, social studies, and foreign languages recommended in *A Nation at Risk*. There was a slight drop in the percentage taking the recommended four years of English. And while no information was available for science in 1982, three in four students were meeting the science course-taking recommendation in 1988. The increase in English course credits registered for all high school graduates from 1982 to 1987 seems to have been concentrated among the non-college bound.

Among college-bound seniors, there were small differences in mathematics and science course-taking in 1988, with females typically taking slightly fewer courses than males, except for biology, taken by 97 percent of the females and 96 percent of the males. In physics, the gender gap was particularly large — 16 percentage points in favor of males.

The percentage of college-bound seniors taking four years of English declined for all racial and ethnic subgroups, but the range of differences was not large in 1988. In 1988, all subgroups came closer to meeting the Excellence Commission's recommendation of three years of mathematics, and again, the range among the subgroups was narrow.

Relatively small gains were registered by all subgroups in the percentage of students fulfilling the recommended requirement of three years of social studies, but there were large gains in the percentage of students taking two years of foreign languages.

ELEVENTH GRADE

The differences between male and female enrollments in mathematics and science courses in 1984 were negligible in the 11th grade; larger differences appeared, however, in courses usually taken in the 12th grade, such as calculus. There were substantial differences among racial and ethnic subgroups for algebra I, algebra II, and geometry; the percentage point spreads from the top to the bottom group were 28, 32, and 37 respectively.

In biology courses, we were approaching uniformity among racial/ethnic groups by 1984. In chemistry, however, the range was from a low of 22 percent to a high of 65 percent. The variation in the percentage of students taking computer programming courses was also large.

More females took vocational education courses than did males, although there was considerable variation in the kinds of courses taken. While vocational education has been charged by some to be a "dumping ground" for minority students, there was little variation among White, Black, and Hispanic 11th graders in the number of vocational courses they had taken; gaps may emerge in the 12th grade, however. Students whose parents had postsecondary education were least likely to be taking vocational education courses, although over half of these students had taken some vocational education.

EIGHTH AND FOURTH GRADE

There is a high degree of standardization in basic subjects studied in these grades, but data for 1984 permit looking at subjects where there is variation. While science is increasingly considered important in the earlier school years, there was a large variation by subgroup in the percent of 8th graders having science classes each week (ranging from 67 to 90 percent). The differences were generally small for computer study, although, at most, one in five had computer classes.

From three in 10 to almost half had weekly classes in music; there was greater uniformity for art, with about one in three having classes. A negligible percentage of all subgroups had drama classes each week. White 8th graders were more likely than other subgroups to report taking science and music; Asian-American students were more likely to report studying art.

At the 4th grade, there was less uniformity in the percentage of students taking gym in 1984 than at the 8th-grade level (ranging from 66 to 85 percent). About 10 percentage points separated the top and bottom groups in

science; the range in the study of computers was far smaller, however.

While White 4th graders were more likely to be taking music and art than their peers from other racial/ethnic groups, the rest of the groups were fairly close to each other; White students were least likely to report having drama classes, with no large variation for the rest of the subgroups.

ANALYSIS OF VARIATIONS AT ELEVENTH, EIGHTH, AND FOURTH GRADES

Statistical analyses using the 1984 data for these three grades were undertaken to identify factors associated with differences in subjects studied. Among 11th-grade students, from a fourth to over a third of the variations in course-taking among subgroups could be explained by differences in students' sex, level of parent's education, study aids in the home, and educational expectations (leaving from two-thirds to three-fourths of the variations unaccounted for). Higher educational expectations of the students were associated with higher rates of academic course-taking for most subgroups. The socio-economic level of the school itself had minimal impact and "school climate" had none.

For 8th graders, the socioeconomic level of the parents was only modestly related to subjects studied; the strongest relationship observed was the positive association between performance and the number of study aids in the home. The same pattern was observed for 4th-grade students.

Differences in course-taking by socioeconomic level emerge in high school, where there is considerably more room for student choice (or counselor assignment) in course-taking; before that, the standardization of curriculum minimizes the amount of variation across students.

This report describes only the quantity of courses taken, and not their quality. Thus, while the data may indicate that historical disparities in course-taking have lessened, this does not necessarily mean that access to the same quality of courses has been equalized. This is something more difficult to measure and resolve.

Where trend data are available, there seems to be progress in that students are taking more rigorous academic courses. Increases are being registered for males and females and for all racial and ethnic groups. While these recent improvements have largely failed to include calculus and physics, the typical 4th-year courses in mathematics and science, the new requirements being enacted by states are yet to have their full impact. Some legislative changes will affect high school students now enrolled, and continued advances should be in the offing, at least through the high school graduating class of 1989.

Despite their overall success in strengthening the core high school curriculum, the course-taking requirements that have already been established by some states leave substantial room for improvement in closing gaps among subgroups at all levels and in reducing differences that result from disparate social and economic backgrounds. It also remains to be seen whether this progress will reach the highest-level courses in science and mathematics, where progress has so far been slight.

APPENDIX A

Contents **Page**

Table 1 Percentage of High School Graduates Who Took Selected Mathematics Courses, 1982 and 1987 19

Table 2 Percentage of High School Graduates Who Took Selected Mathematics Courses, by Sex, 1982 and 1987 ... 19

Table 3 Percentage of High School Graduates Who Took Selected Science Courses, 1982 and 1987 19

Table 4 Percentage of High School Graduates Who Took Selected Science Courses, by Sex, 1982 and 1987 19

Table 5 Percentage of High School Graduates Who Took Selected Mathematics Courses, by Race/Ethnicity, 1982 and 1987 20

Table 6 Percentage of High School Graduates Who Took Selected Science Courses, by Race/Ethnicity, 1982 and 1987 20

Table 7 Average Number of Credits Earned by High School Graduates in Various Subject Fields, 1982 and 1987 20

Table 8 Percentage of High School Graduates Who Took Selected Mathematics Courses, by Academic Track, 1982 and 1987 20

Table 9 Percentage of High School Graduates Who Took Selected Science Courses, by Academic Track, 1982 and 1987 21

Table 10 Percentage of 11th Graders Who Have Taken Selected Mathematics and Science Courses, by Sex 21

Table 11 Percentage of 11th Graders Who Have Taken Selected Mathematics and Science Courses, by Race/Ethnicity 22

Table 12 Percentage of 11th Graders Who Have Taken Selected Mathematics and Science Courses, by Level of Parental Education 23

Table 13 Percentage of 11th Graders Who Have Taken Foreign Language Courses, by Race/Ethnicity and Level of Parental Education 23

Table 14 Number of Years of Business or Vocational Course Work Completed by 11th-Grade Students, by Gender, Race/Ethnicity, Level of Parental Education, and Age, 1983-84 24

Table 15 Percentage of 4th Graders Taking Gym, Science, Drama, Computer, Music, and Art Courses, by Race/Ethnicity and Language Minority Status 25

Table 16 Percentage of 4th and 8th Graders Taking Gym, Science, Drama, Computer, Music, Art, and Foreign Language Courses, by Level of Parental Education 26

Table 1

Percentage* of High School Graduates Who Took Selected Mathematics Courses, 1982 and 1987

Courses Taken	1982	1987	Percentage Point Change From 1982-1987
Algebra I	65.1**	77.2	+12.1***
Geometry	45.7	61.0	+15.3***
Algebra II	35.1	46.1	+11.0***
Trigonometry	12.0	20.4	+8.4***
Pre-Calculus	5.8	12.4	+6.6***
Calculus	4.7	6.1	+1.4

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: "Nation at Risk Study as part of the 1987 High School Transcript Study", Tabulations, May 19, 1988, Westat Inc., for the U.S. Department of Education, National Center for Education Statistics, Table 32.

Table 2

Percentage* of High School Graduates Who Took Selected Mathematics Courses, by Sex, 1982 and 1987

Courses	Male	Female
1982 Graduates		
Algebra I	73.3**	66.8
Geometry	45.0	46.4
Algebra II	35.3	34.9
Trigonometry	12.9	11.3
Pre-calculus	6.0	5.5
Calculus	5.3	4.2
1987 Graduates		
Algebra I	75.8***	78.5***
Geometry	61.1***	60.8***
Algebra II	44.1***	47.9***
Trigonometry	21.9***	19.0***
Pre-calculus	13.5***	11.3***
Calculus	7.6***	4.7

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 33.

Table 3

Percentage* of High School Graduates Who Took Selected Science Courses, 1982 and 1987

Courses Taken	1982	1987	Percentage Point Change From 1982-1987***
Biology	75.3**	89.6	+14.3
Chemistry	30.8	45.4	+14.6
Physics	13.9	20.1	+6.1

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 40.

Table 4

Percentage* of High School Graduates Who Took Selected Science Courses, by Sex, 1982 and 1987

Courses	Male	Female
1982 Graduates		
Biology	73.3**	77.1
Chemistry	31.7	30.0
Physics	18.2	10.0
*1987 Graduates****		
Biology	88.5	90.8
Chemistry	46.3	44.5
Physics	25.3	15.0

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 41.

Table 5

Percentage* of High School Graduates Who Took Selected Mathematics Courses, by Race/Ethnicity, 1982 and 1987

	White	Black	Hispanic	Asian
1982 Graduates				
Algebra I	68.1**	57.5	55.1	66.2
Geometry	51.2	28.5	25.8	64.3
Algebra II	38.7	24.2	20.8	56.4
Trigonometry	13.6	6.0	6.4	28.2
Pre-calculus	6.7	2.2	3.0	13.7
Calculus	5.5	1.4	1.8	13.2
1987 Graduates				
Algebra I	78.2***	70.7***	76.6***	66.2
Geometry	64.2***	43.6***	44.3***	82.3***
Algebra II	51.4***	32.3***	33.2***	68.3***
Trigonometry	21.7***	12.3***	11.5***	47.0***
Pre-calculus	13.0***	5.0***	8.0***	41.3***
Calculus	5.9	2.4	4.1	33.0***

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 34.

Table 6

Percentage* of High School Graduates Who Took Selected Science Courses, by Race/Ethnicity, 1982 and 1987

	White	Black	Hispanic	Asian
1982 Graduates				
Biology	77.3**	70.9	67.2	82.2
Chemistry	34.2	20.5	15.4	51.4
Physics	16.0	6.9	5.6	33.8
*1987 Graduates****				
Biology	91.0	84.7	85.9	93.3
Chemistry	48.0	30.3	31.8	72.3
Physics	21.1	10.6	11.2	50.0

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 42.

Table 7

Average Number of Credits Earned by High School Graduates in Various Subject Fields, 1982 and 1987

Subject Field	1982 Graduates	1987 Graduates	Change 1982-1987
English	3.80	4.05	+0.25*
History	1.68	1.91	+0.23*
Social Studies	1.42	1.44	+0.02
Mathematics	2.54	2.98	+0.45*
Computer Science	0.11	0.42	+0.31*
Science	2.19	2.63	+0.44*
Foreign Language	1.05	1.47	+0.44*
Non-Occup. Vocational Ed.	1.84	1.66	−0.19*
Occup.Vocational Ed.	2.14	2.09	−0.05
Arts	1.39	1.41	+0.02
Physical Education	1.93	2.00	+0.07

* Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 8 *1982 Graduates*.

Table 8

Percentage* of High School Graduates Who Took Selected Mathematics Courses, by Academic Track, 1982 and 1987

	Academic Track		
Mathematics Courses	Academic	Vocational	Other
1987 Graduates			
Algebra I	76.7**	55.4	55.2
Geometry	73.6	17.1	26.3
Algebra II	58.3	11.5	18.9
Trigonometry	24.5	1.1	3.4
Pre-calculus	11.8	0.5	1.5
Calculus	10.6	0.2	0.5
1987 Graduates			
Algebra I	81.3***	67.6***	68.7***
Geometry	80.2***	20.4	29.7
Algebra II	63.6***	11.9	16.0
Trigonometry	31.5***	1.8	3.2
Pre-calculus	19.5***	0.4	1.7
Calculus	10.0	0.0	0.2

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 55.

Table 9

Percentage* of High School Graduates Who Took Selected Science Courses, by Academic Track, 1982 and 1987

	Academic Track		
Science Courses	**Academic**	**Vocational**	**Other**
1987 Graduates			
Biology	91.8**	58.3	62.2
Chemistry	59.2	5.8	9.6
Physics	30.0	1.4	1.7
1987 Graduates			
Biology	95.8***	75.3***	77.6***
Chemistry	67.3***	4.6	12.4***
Physics	31.7***	0.9	0.9***

* Percentages are weighted to yield population estimates.
** Standard errors are not reported.
*** Differences between 1982 and 1987 graduates are significant at 0.05 level.
Source: Westat Inc., *op.cit.*, Table 55.

Table 10

Percentage* of 11th Graders Who Have Taken Selected Mathematics and Science Courses, by Sex

Courses	**Male**	**Female**
Mathematics		
Algebra I	82.5 (1.3)**	83.6 (1.5)
Geometry	62.4 (1.6)	59.1 (2.2)
Algebra II	53.3 (2.1)	52.1 (2.0)
Calculus	2.7 (0.5)	2.5 (0.5)
Science		
Biology	81.3 (2.0)	83.1 (1.4)
Chemistry	41.0 (2.2)	37.5 (2.4)
Computer Programming	31.6 (2.6)	26.5 (2.2)

* Percentages are weighted to yield population estimates.
** Standard errors are in parentheses.
Source: *Course Taking Patterns in the 1980s*, Margaret E. Goertz, Center for Policy Research in Education, 1989, Table 1.

Table 11

Percentage* of 11th Graders Who Have Taken Selected Mathematics and Science Courses, by Race/Ethnicity

	White**	Black**	Hispanic Non-LM	Hispanic Lang Min	Asian Non-LM	Asian Lang Min
Mathematics						
Algebra I	86.8 (1.0)***	70.8 (3.2)	79.0 (3.7)	69.3 (8.0)	97.2 (2.7)	70.3 (11.1)
Geometry	65.9 (1.7)	46.0 (4.0)	51.5 (5.7)	34.8 (6.7)	72.4 (7.0)	55.3 (14.7)
Algebra II	56.2 (2.0)	40.3 (4.1)	45.9 (6.2)	40.6 (5.4)	71.9 (14.6)	65.1 (16.2)
Calculus	2.3 (0.4)	1.4 (0.7)	5.8 (2.5)	5.9 (2.7)	11.1 (11.2)	2.9 (2.9)
Science						
Biology	82.0 (1.4)	81.7 (3.5)	82.3 (5.3)	86.1 (6.6)	71.2 (9.8)	82.5 (6.3)
Chemistry	42.2 (2.0)	28.6 (3.8)	29.6 (4.2)	22.1 (4.9)	61.6 (12.5)	64.9 (11.4)
Computer Programming	30.6 (2.5)	22.1 (2.9)	21.8 (6.2)	19.5 (6.8)	43.8 (12.5)	51.5 (10.8)

* Percentages are weighted to yield population estimates.
** Figures are for non-language minority students only.
*** Standard error in parentheses.
Source: *The Educational Progress of Language Minority Students. Findings from the 1983-84 NAEP Reading Survey.* Joan C. Baratz Snowden and Richard Duran, National Assessment of Educational Progress, Educational Testing Service, January, 1987, Table 11.

Table 12

Percentage* of 11th Graders Who Have Taken Selected Mathematics and Science Courses, by Level of Parental Education

Courses	Level of Parental Education: Not High School Graduate	High School Graduate	Postsecondary Education
Mathematics			
Algebra I	60.2 (3.9)**	77.6 (1.7)	92.4 (1.1)
Geometry	31.4 (3.4)	49.0 (2.0)	75.8 (2.3)
Algebra II	27.3 (3.2)	41.7 (1.9)	65.7 (2.6)
Calculus	2.5 (1.1)	2.1 (0.6)	3.0 (0.5)
Science			
Biology	73.8 (4.1)	78.0 (2.0)	87.2 (1.4)
Chemistry	21.1 (2.8)	25.8 (2.0)	52.6 (2.1)
Computer Programming	19.8 (3.7)	24.8 (2.4)	33.3 (3.0)

* Percentages are weighted to yield population estimates.
** Standard errors are in parentheses.
Source: *The Educational Progress of Language Minority Students, Findings from the 1983-84 NAEP Reading Survey*, Joan C. Baratz-Snowden and Richard Duran, National Assessment of Educational Progress, Educational Testing Service, January, 1987, Table 12.

Table 13

Percentage* of 11th Graders Who Have Taken Foreign Language Courses, by Race/Ethnicity and Level of Parental Education

	Years of Reported Foreign Language Course-taking: 0-0.5 Yr.	1.0-1.5 Yrs.	2.0 or more
Race Ethnicity			
White	45.0	25.4	29.8
Black	55.2	22.2	22.6
Hispanic	40.1	27.3	32.6
Parental Education			
Not Graduated High School	65.6	19.7	14.6
High School Graduate	58.1	22.8	19.2
Postsecondary Education	33.1	28.2	38.8

* Percentages are weighted to yield population estimates.
Source: M. Goertz, *op.cit.*, Table 4.

Table 11

Number of Years of Business or Vocational Course Work Completed by 11th Grade Students, by Gender, Race/Ethnicity, Level of Parental Education, and Age: 1985-86

	None	0.5	One	1.5	Two	2.5	Three	3.5 or more
All Students	42.3 (1.1)**	7.4 (0.6)	24.2 (0.6)	2.6 (0.2)	15.9 (0.6)	1.1 (0.1)	3.8 (0.2)	2.7 (0.2)
Student Characteristics								
Gender								
Male	48.7 (0.9)	7.8 (0.6)	21.7 (0.6)	2.2 (0.2)	12.7 (0.5)	0.9 (0.1)	3.4 (0.3)	2.5 (0.3)
Female	36.1 (1.5)	7.0 (0.7)	26.6 (0.7)	2.9 (0.3)	19.0 (0.8)	1.3 (0.1)	4.3 (0.3)	2.8 (0.3)
Race/Ethnicity								
White, non-Hispanic	41.8 (1.2)	7.4 (0.6)	24.3 (0.7)	2.5 (0.2)	16.4 (0.7)	1.0 (0.1)	3.9 (0.2)	2.8 (0.3)
Black, non-Hispanic	41.4 (2.3)	7.4 (1.4)	24.1 (1.3)	3.1 (0.7)	15.8 (1.5)	1.7 (0.3)	4.2 (0.7)	2.2 (0.4)
Hispanic	46.3 (2.1)	7.5 (1.2)	24.5 (1.1)	2.7 (0.4)	12.9 (1.8)	0.9 (0.4)	3.1 (0.7)	2.2 (0.5)
Other	53.0 (2.0)	7.7 (1.5)	21.0 (1.4)	2.6 (0.6)	10.2 (1.1)	0.3 (0.2)	3.0 (0.7)	2.2 (0.7)
Parental Education								
Not High School Graduate	34.4 (1.5)	5.9 (0.9)	25.6 (1.3)	2.7 (0.4)	20.2 (1.2)	1.2 (0.2)	5.9 (0.7)	4.0 (0.5)
High School Graduate	4.9 (0.9)	6.4 (0.6)	26.2 (0.7)	2.8 (0.3)	19.7 (0.6)	1.3 (0.2)	5.4 (0.3)	3.3 (0.4)
Post High School Educ.	48.2 (1.6)	8.3 (0.8)	22.7 (0.8)	2.4 (0.2)	12.9 (0.7)	0.9 (0.1)	2.5 (0.2)	2.0 (0.2)
Unknown	45.4(2.5)	8.4 (1.6)	24.0 (1.9)	3.5 (1.1)	12.5 (1.7)	1.5 (0.6)	2.6 (0.7)	2.1 (0.7)

* Percentages are weighted to yield population estimates.
** Standard errors are in parentheses.
Source: M. Goertz, *op. cit.*, Table 5.

Table 15

Percentage* of 4th and 8th Graders Taking Gym, Science, Drama, Computer, Music and Art Courses, by Race/Ethnicity and Language Minority Status

	White**	Black**	Hispanic Non-LM	Hispanic Lang Min	Asian Non-LM	Asian Lang Min
Grade 4						
Gym	85.3 (1.4)***	74.7 (2.6)	72.5 (3.6)	65.2 (5.8)	79.7 (4.0)	65.6 (9.0)
Science	80.4 (0.8)	78.9 (2.0)	78.2 (2.1)	75.9 (1.9)	68.8 (5.4)	67.9 (8.7)
Drama	6.0 (0.4)	13.1 (1.6)	10.9 (1.5)	15.7 (2.5)	13.0 (4.9)	12.3 (5.2)
Computer	28.4 (2.3)	23.7 (2.6)	29.7 (3.8)	27.6 (6.8)	30.4 (8.5)	25.7 (4.2)
Music	83.9 (1.9)	71.3 (3.7)	71.3 (3.7)	71.4 (4.3)	82.2 (4.1)	73.3 (4.7)
Art	74.5 (2.6)	69.4 (4.1)	69.4 (4.1)	69.2 (4.2)	68.8 (6.7)	64.9 (9.5)
Grade 8						
Gym	86.0 (1.6)	79.4 (3.1)	79.0 (4.1)	69.2 (12.6)	79.0 (4.7)	79.3 (4.0)
Science	89.0 (1.6)	84.2 (1.3)	73.0 (6.4)	66.6 (7.5)	78.1 (6.0)	71.2 (5.7)
Drama	4.4 (0.6)	5.4 (0.7)	5.6 (1.5)	6.1 (1.4)	4.0 (1.8)	2.6 (1.1)
Computer	18.6 (1.5)	18.1 (1.9)	14.8 (6.2)	12.3 (2.5)	20.5 (3.7)	20.9 (3.3)
Music	45.9 (2.3)	39.0 (3.0)	39.8 (3.1)	32.2 (4.5)	26.6 (3.7)	42.4 (7.8)
Art	35.1 (2.1)	34.9 (3.1)	31.2 (2.7)	33.6 (5.9)	36.8 (4.6)	42.8 (6.1)

* Percentages are weighted to yield population estimates.
** Figures are for non-language minority students only. Source: M. Goertz, *op.cit.*, Table 6.
*** Standard error in parentheses.
Source: M. Goertz, *op.cit.*, Table 6.

Table 16

Percentage* of 4th and 8th Graders Taking Gym, Science, Drama, Computer, Music, Art, and Foreign Language Courses, by Level of Parental Education

	Level of Parental Education		
Courses	**Not High School Graduate**	**High School Graduate**	**Postsecondary Education**
Fourth Grade			
Gym	76.4 (2.6)**	80.8 (1.4)	83.6 (1.4)
Science	80.4 (2.2)	81.7 (1.1)	80.0 (1.1)
Drama	10.8 (1.4)	6.1 (0.6)	9.1 (0.7)
Computer	27.1 (3.2)	25.2 (1.9)	31.1 (2.5)
Music	74.0 (3.6)	81.0 (2.4)	83.7 (1.5)
Art	69.6 (2.8)	74.8 (2.7)	73.9 (2.4)
Eighth Grade			
Gym	79.4 (3.3)	84.3 (1.8)	85.3 (1.6)
Science	83.2 (2.7)	88.1 (1.8)	88.1 (1.6)
Drama	4.2 (0.4)	3.9 (0.4)	5.4 (0.7)
Computer	12.6 (1.3)	16.2 (1.5)	21.6 (1.4)
Music	34.2 (2.5)	44.5 (2.6)	46.8 (1.9)
Art	30.3 (2.1)	36.5 (2.3)	34.9 (1.9)
Foreign Languages	14.3 (1.2)	13.8 (1.1)	27.6 (2.3)

*Percentages are weighted to yield population estimates.
** Standard errors are in parentheses.
Source: M. Gaertz, *op. cit.*, Table 7

Technical Notes

This report is based on a research paper prepared at Educational Testing Service by Margaret E. Goertz, titled *Course-Taking Patterns in the 1980s* (1989). Her report was commissioned by the Center for Policy Research in Education. Complete technical discussion, methodological procedures, and references are provided in that report, and can be obtained from The Center for Policy Research in Education. *What Americans Study* contains some data not included in the final paper by Margaret Goertz.

Data on high school graduates (Section II) are drawn from a report prepared by Westat, Inc. for the U.S. Department of Education, titled "Tabulations, May 10, 1988: Nation at Risk Update Study as Part of the 1987 High School Transcript Study". Both the 1982 and 1987 data come from the transcripts of national samples of high school seniors, the *High School and Beyond Study for 1982*, and the *High School Transcript Study for 1987*.

The section on college-bound seniors is based on information from the Student Descriptive Questionnaire filled out by the students who took the SAT in 1982 and 1988 (filling out this questionnaire is voluntary; 95% did so in 1988).

Information for 11th, 8th, and 4th graders derives (originally) from the 1983-84 survey by the National Assessment of Educational Progress (NAEP), administered by Educational Testing Service and funded by the Department of Education's National Center for Education Statistics. All original analyses by Margaret Goertz of NAEP data were funded by the Center for Policy Research in Education (from a grant by the U.S. Department of Education, Office of Educational Research and Improvement). Funds for *What Americans Study* were provided by Educational Testing Service.

The report uses the term "language-minority students." Students were designated language minority if they answered either "Spanish" or "Another language" to the question:

What language do *most* people in your home speak?

- English
- Spanish
- Another language.

This category includes students with diverse language skills, encompassing students who may be bilingual, those who may be monolingual English speakers, and those whose skills in English may be quite limited. Students whose knowledge of English was judged by the school to be insufficient to participate in the assessment were excluded from the test administration.

Standard errors are provided in the Appendix tables (in parentheses) for data on 11th-, 8th-, and 4th-grade students. These are jackknifed standard errors. A full description of the procedures used can be found in *Implementing the New Design: The NAEP 1983-84 Technical Report*, Albert E. Beaton, *et al*, Educational Testing Service, Princeton, NJ, 1988, pp. 507-512.

The NAEP data on courses taken are based on student self-reports. A comparison of self-reported data for 11th graders with transcript data shows a high degree of correspondence. We would expect less accuracy at lower grades and particularly among 4th-grade students; however, we do expect that these students know the subjects they study each week and can report this with reasonable accuracy. Their reports on level of parents' education and other family background information are likely to be much less accurate.